

SET-VALUED STOCHASTIC INTEGRAL EQUATIONS

Marek T. Malinowski¹ and Mariusz Michta^{1,2}

¹Faculty of Mathematics, Computer Science and Econometrics,
University of Zielona Góra,
Szafrana 4a, 65-516 Zielona Góra, Poland,

²Institute of Mathematics and Informatics
Opole University
Oleska 48, 45-052 Opole, Poland

Corresponding author email: m.michta@wmie.uz.zgora.pl

Dedicated to Professor N.U. Ahmed on the occasion of his 75th birthday

Abstract. We consider the set-valued trajectory stochastic integrals of Itô's and Aumann's types. Some properties of these integrals are stated. Then we examine the equations in which the set-valued trajectory stochastic integrals appear. The result on existence and uniqueness of the solution to set-valued stochastic integral equation driven by m -dimensional Wiener process is proven. A generalization in the form of vector-set-valued stochastic integral equation is proposed.

Keywords. Set-valued trajectory stochastic Itô integral, set-valued trajectory stochastic Aumann integral, set-valued stochastic integral equation.

AMS (MOS) subject classification: 60H05, 60H10, 60H20, 37H10.

1 Introduction

The theory of set-valued differential equations, originally started in 1969 by De Blasi and Iervolino [8], has focused much attention in the last decades since it provides the good models for dynamical systems. The evidence of the set-valued differential equations with the areas as control theory, differential inclusions and fuzzy differential equations can be found in Diamond and Kloeden [12], Kisielewicz [16], Lakshmikantham, Leela and Vatsala [24], Lakshmikantham and Mohapatra [25], Lakshmikantham and Tolstonogov [26], Lakshmikantham, Bhaskar and Devi [23], Tolstonogov [35] and references therein. For further developments, also in other directions, see Artstein [5], De Blasi [7], Brandão Lopes Pinto, De Blasi and Iervolino [9], Galanis *et al.* [13], Kisielewicz [18, 19], Kisielewicz, Serafin and Sosulski [22], Michta [29, 30], Plotnikov and Plotnikova [32], Plotnikov and Rashkov [33]. As far as we know the problem of the existence and properties of solutions to stochastic set-valued differential equations was considered in Li and Li